

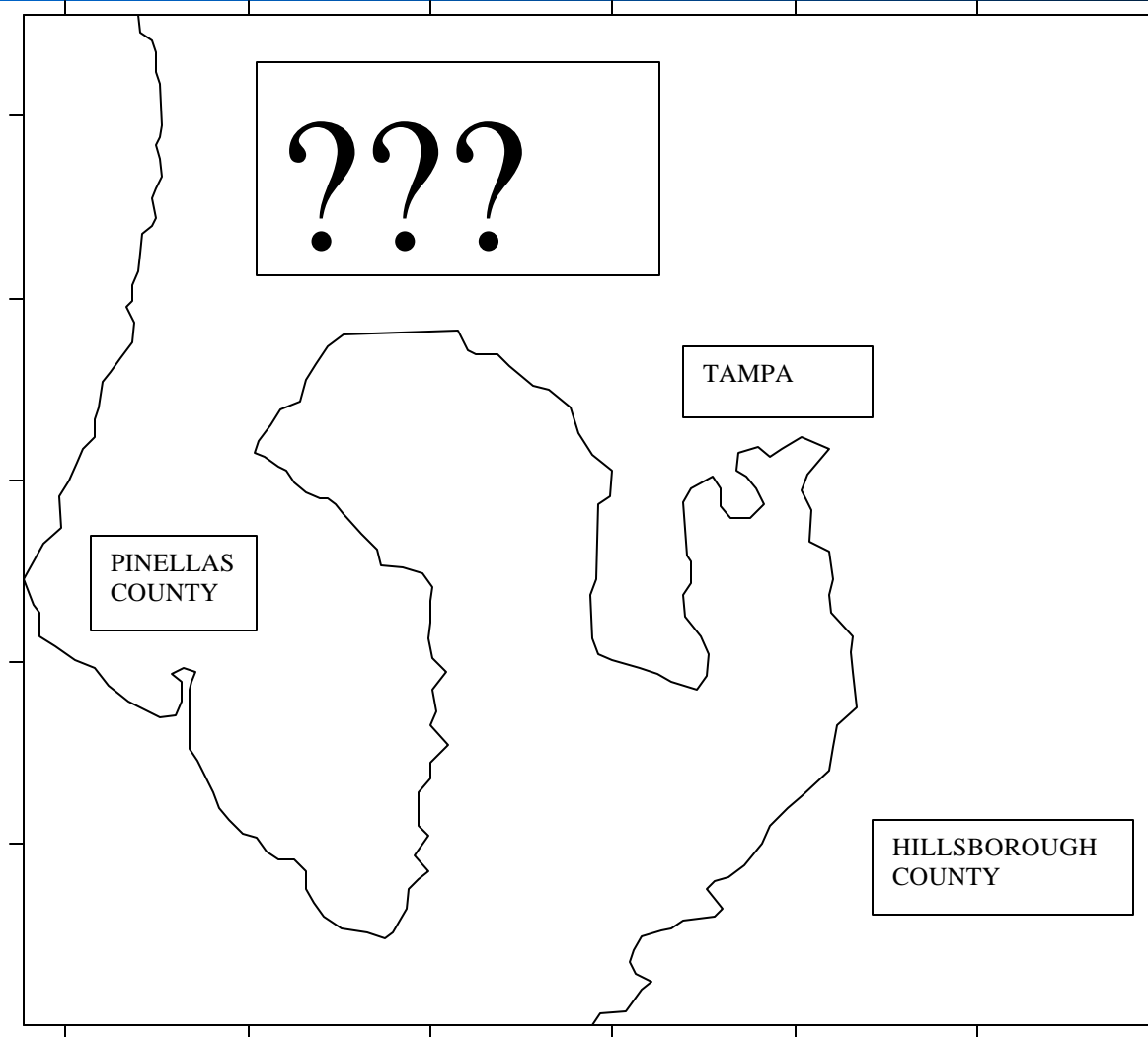
# Air Toxics Emission Inventories & Monitoring in Hillsborough County

Leroy Shelton

Environmental Protection Commission of  
Hillsborough County

Emission Inventory Conference Apr  
15-18, 2002

# 1996



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# 1996 - First Air Toxics Inventory

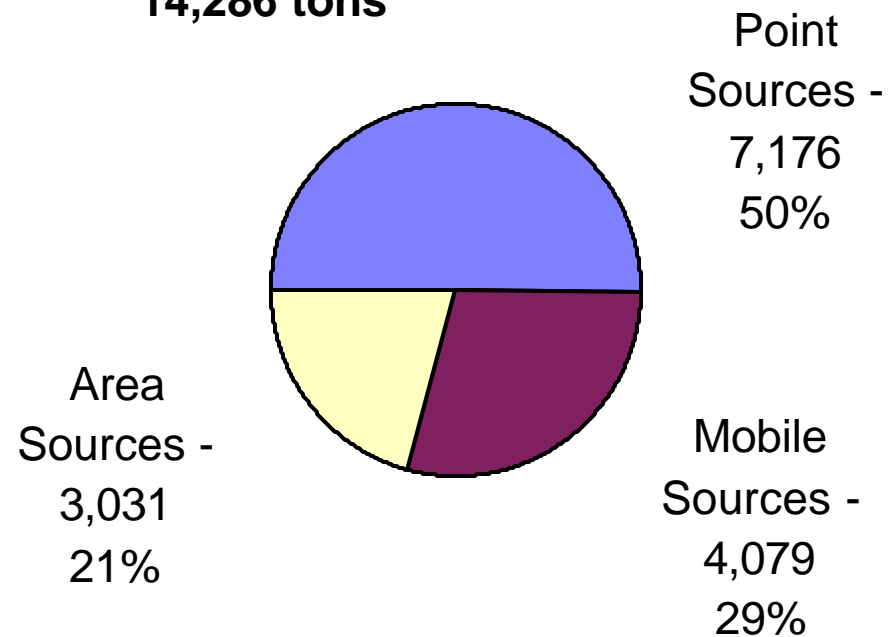
- **Point Sources Only**
- **Used Annual Operating Report (AOR's) throughput information**
- **AP-42, Permits, MSDS sheets**
- **Result = 5,646 tons of HAP's**
  - **Primarily from power plants and garbage burners**

# 1997 Air Toxics Inventory

- **Point, Area, and Mobile Sources**
- **Used AOR's and throughput information from Ozone Maintenance Inventory**
- **Area & Mobile Source Emission Factors were a challenge**
  - **AP-42, Fire, EIIIP, etc**

# 1997 Results

## HAP's in Hillsborough County 14,286 tons



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# 1997 Sources of HAP's

- **96% of Point Sources from 2 sources:**
  - 74% from power plants
  - 22% from garbage burners
- **89% of Area Sources from 2 sources:**
  - 61% from solvent usage
  - 28% from burning (primarily commercial land clearing)
- **86% of Mobile Sources from on-road vehicles**

# Benefits of HAP Inventories

- **National Toxics Inventories**
- **Cumulative Exposure Project (CEP)**
- **National Air Toxics Assessment (NATA)**
- **Air Toxics Monitoring**

# 1997 HAP Emissions

HAP	Emissions	HAP	Emissions
Hydrogen Chloride	6208	Methylene Chloride	20
Toluene	2624	Carbonyl Sulfide	15
Xylene isomers	1718	Methyl Isobutyl ketone	12
Hydrogen Fluoride	582	Ethylene Glycol	11
Methyl Chloride	570	Cyanide	10
Methanol	395	Phenol	7
Benzene	370	Trichloroethylene	7
1,3 Butadiene	346	Ethylene Oxide	7
Formaldehyde	319	Selenium	5
1,1,1 Trichloroethane	183	Chloroform	5
Methyl Ethyl Ketone	108	2,2,4-Trimethylpentane	4
Methyl Bromide	103	MTBE	4
Perchloroethylene	101	Benzyl Chloride	3
Glycol Ethers	84	Isophorone	3
1,3 Dichloropropene	74	POM	2
Ethylbenzene	60	Nickel	2
Styrene	54	Manganese	2
Lead	53	Arsenic	2
Hexane	51	Propionaldehyde	2
P-Dichlorobenzene	39	Chromium	1
Chlorobenzene	33	Cumene	1
Acetaldehyde	30	Mercury	1
Acrolein	28	Cadmium	1
Napthalene	24	<b>Total</b>	<b>14286</b>

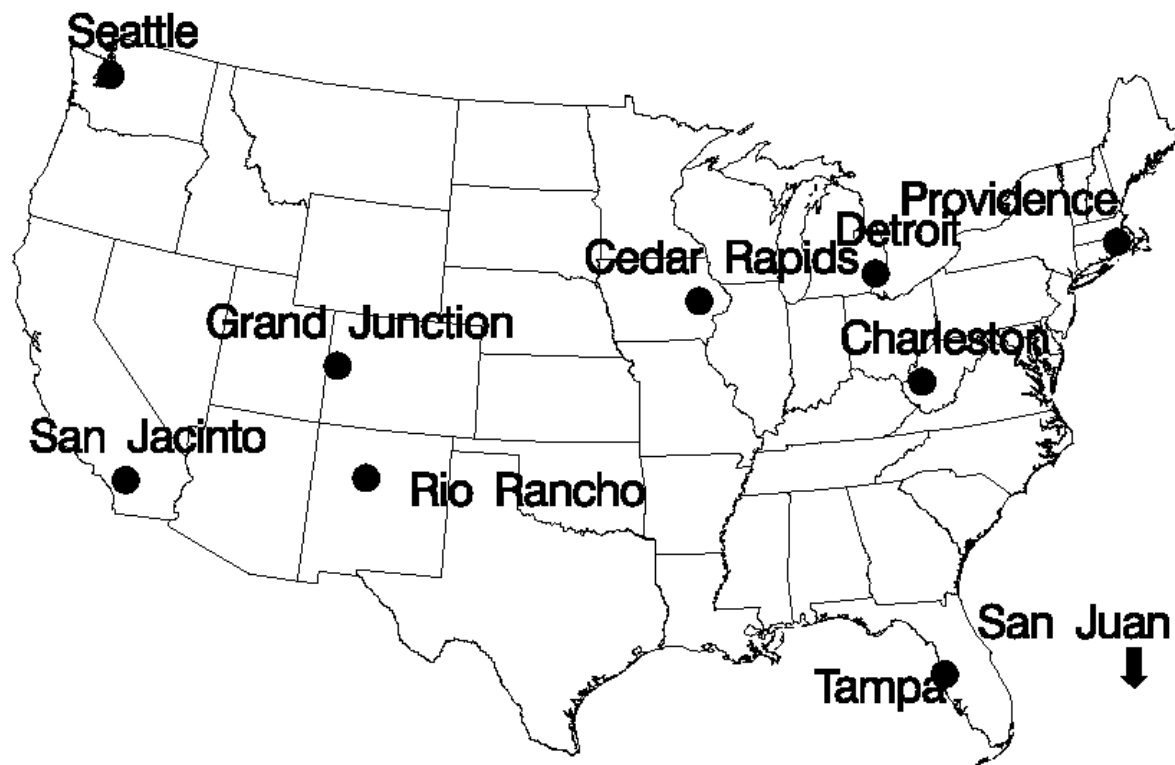
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# Urban Air Toxics Pilot Monitoring Program

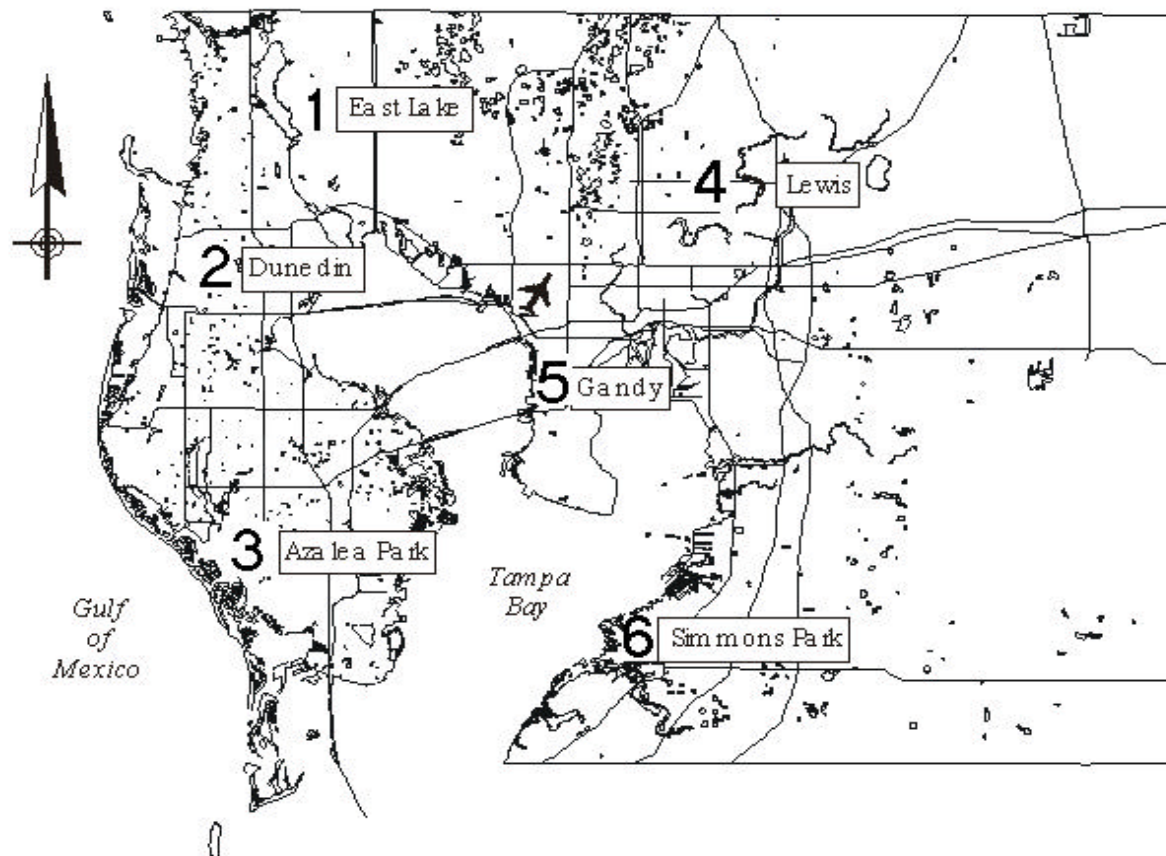
- **Pilot Programs to help design National Network**
- **CY2001 – 10 pilot studies, 1 from each region**
- **Focused on 33 Urban Air Toxics**
- **Required HAP Emissions Inventory**

# Map of the Pilot City Projects - 2001



# TBRATS Monitoring Network

## FY 2001 Air Toxics Monitoring in Tampa Bay



# VOC Sampler



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# Carbonyl Sampler



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# Metals Sampler



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# Air Toxic Monitoring Efforts

- January 1, 2001 – December 31, 2001 at six sites for VOC's, carbonyls, & metals
- 2002 – Continued same suite of sampling at four sites, 2 in each county, for another 12 months
- 2003 - ?

# VOC's

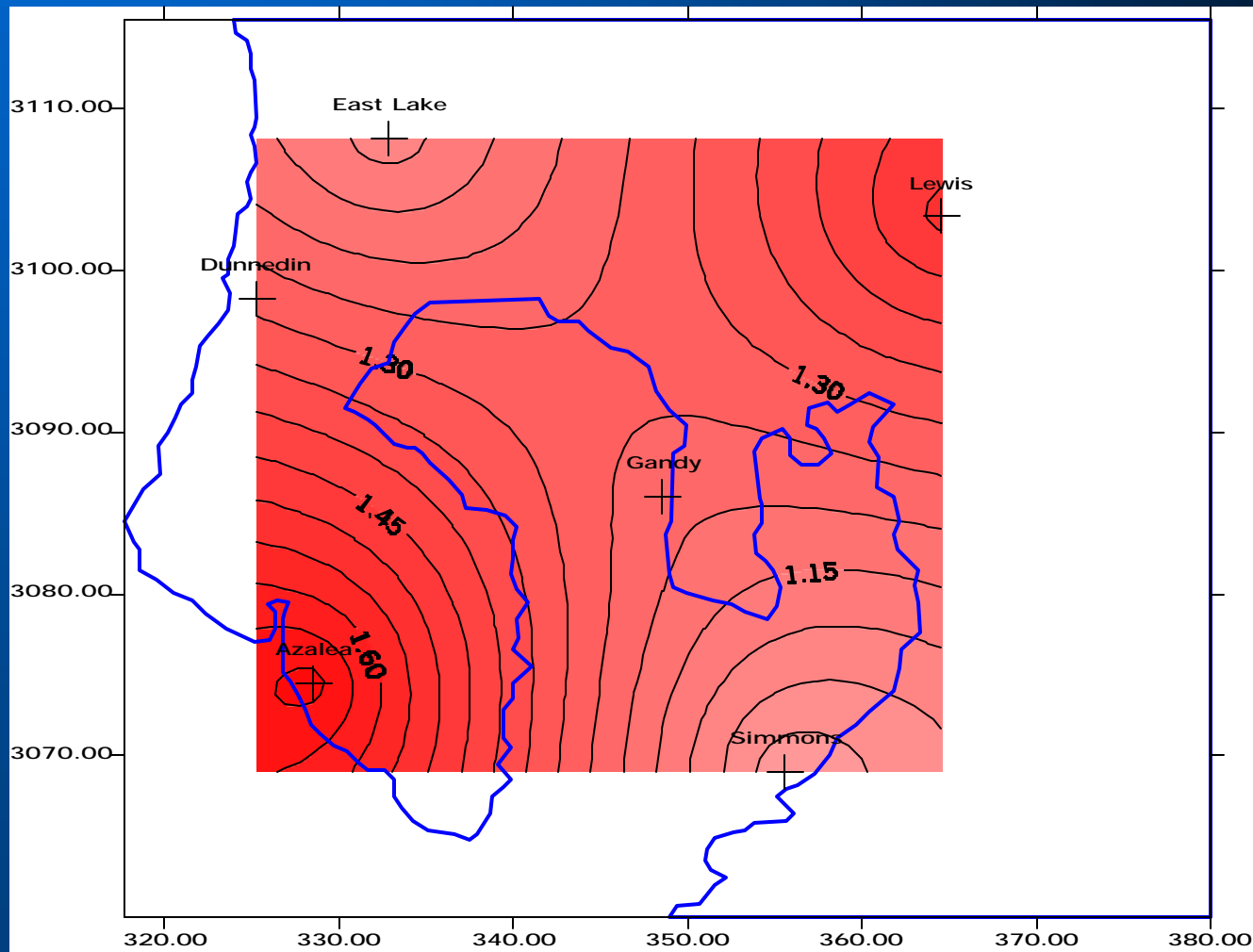
- Measured 40 volatile organics, 29 of which were HAP's, 13 UATS
- 469 total measurements. All but 2 were detected > 98% of the time. Other 2 > 90% of the time.



# VOC's (Jan – Dec 2001)

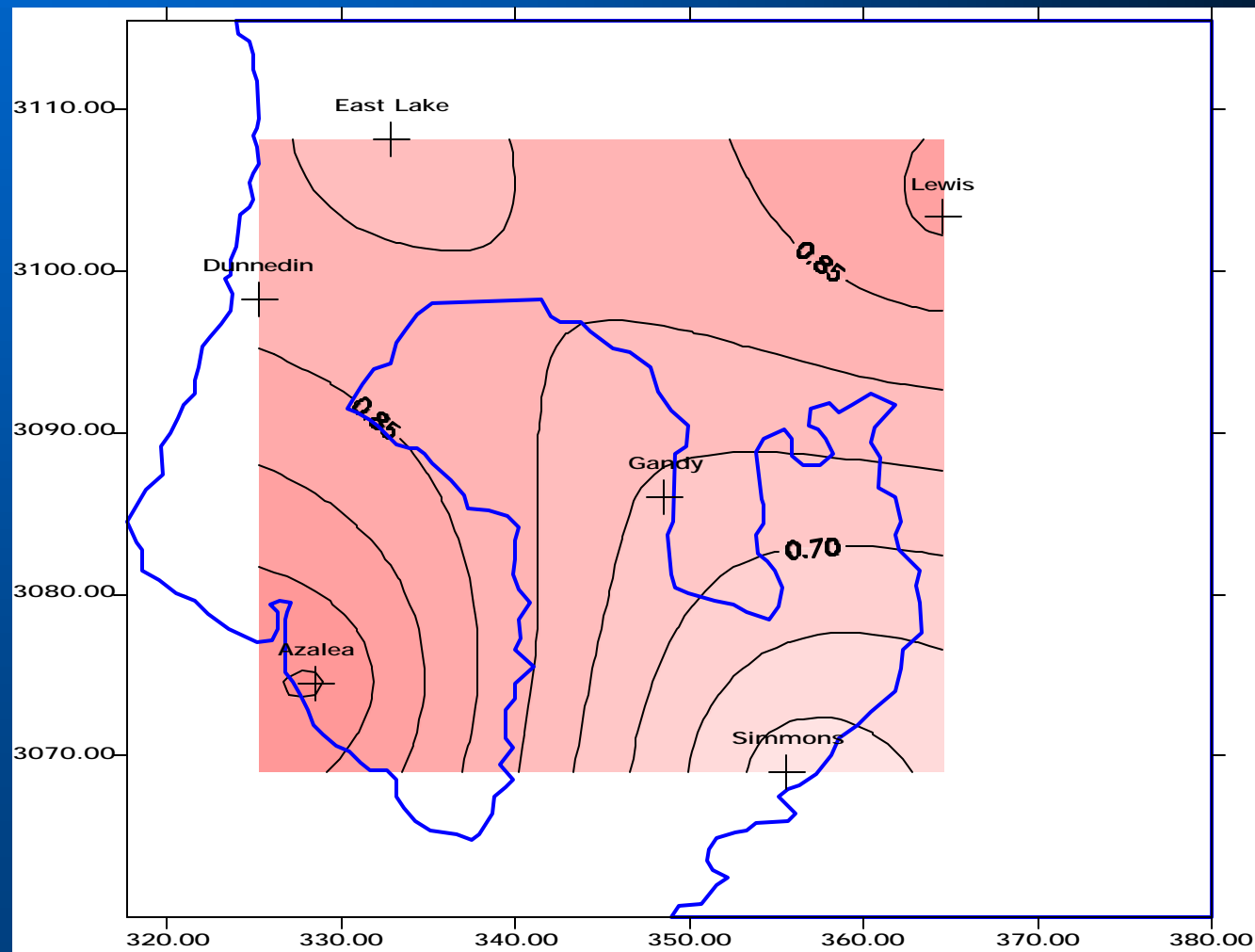
	Annual Average (ug/m3)
Acrylonitrile	0.381
Benzene	0.977
Carbon Tetrachloride	0.623
Chloroform	0.193
Methylene Chloride	0.464
O-xylene	0.218
1,3-butadiene	0.127 (at MDL)
1,3-dichloropropene	<MDL
Ethylene Dibromide	<MDL
Ethylene Dichloride	<MDL
1,1,2,2-tetrachloroethane	<MDL
Trichloroethylene	<MDL
Vinyl Chloride	<MDL

# Benzene Jan - Mar 2001 Averages (ug/m<sup>3</sup>)



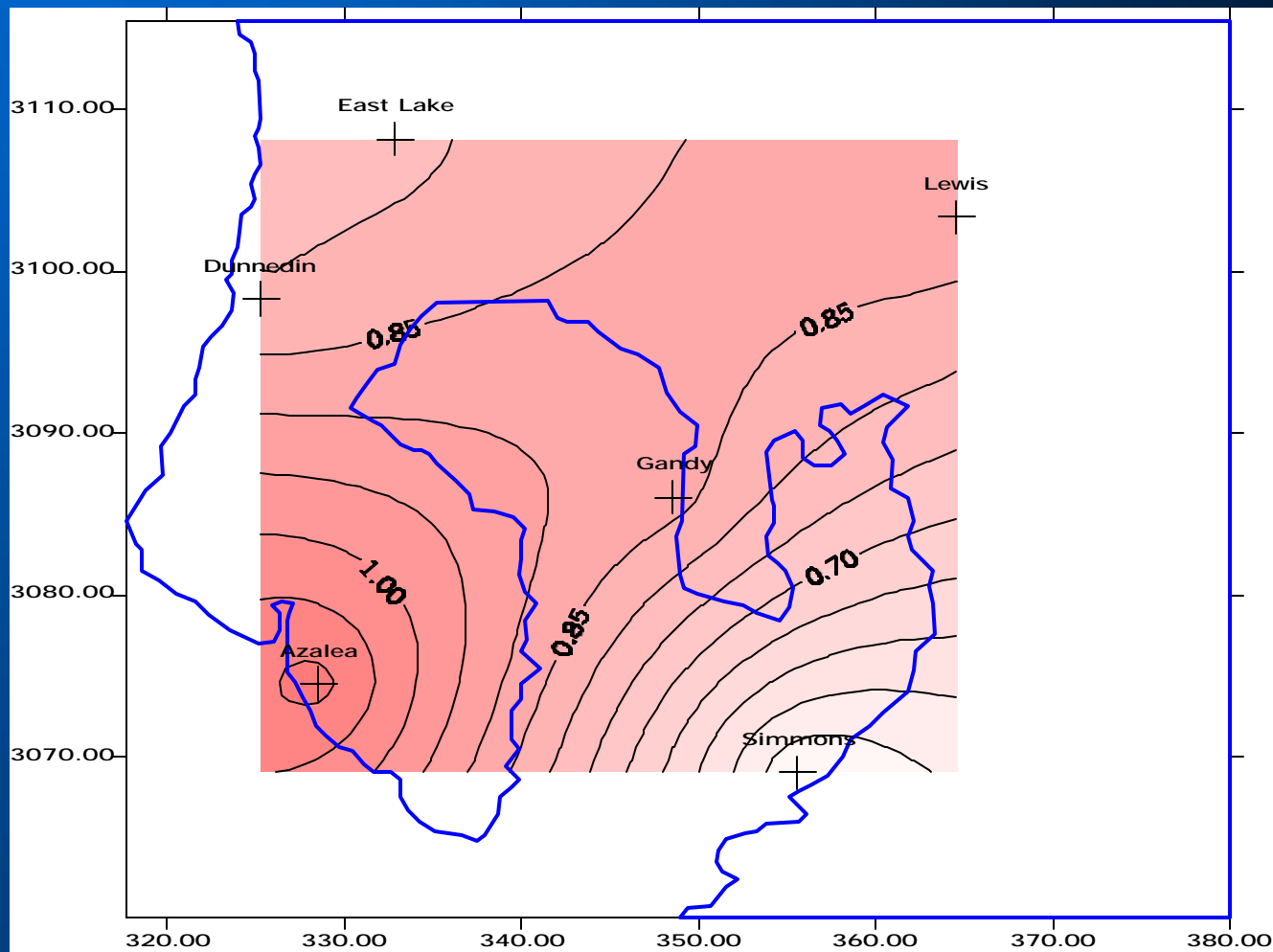
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# Benzene Apr - Jun 2001 Averages ( $\mu\text{g}/\text{m}^3$ )



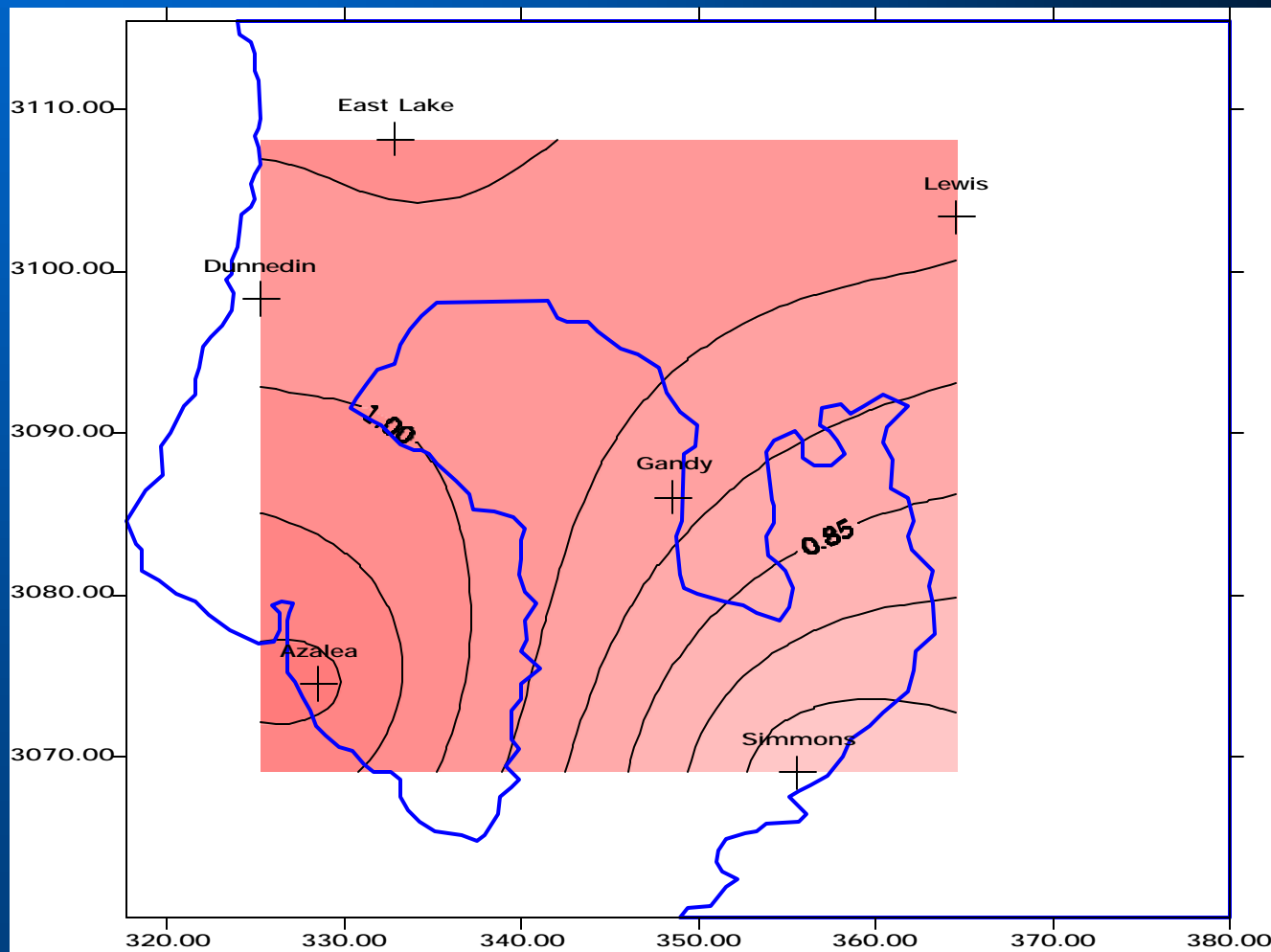
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# Benzene July - Sep 2001 Averages ( $\mu\text{g}/\text{m}^3$ )



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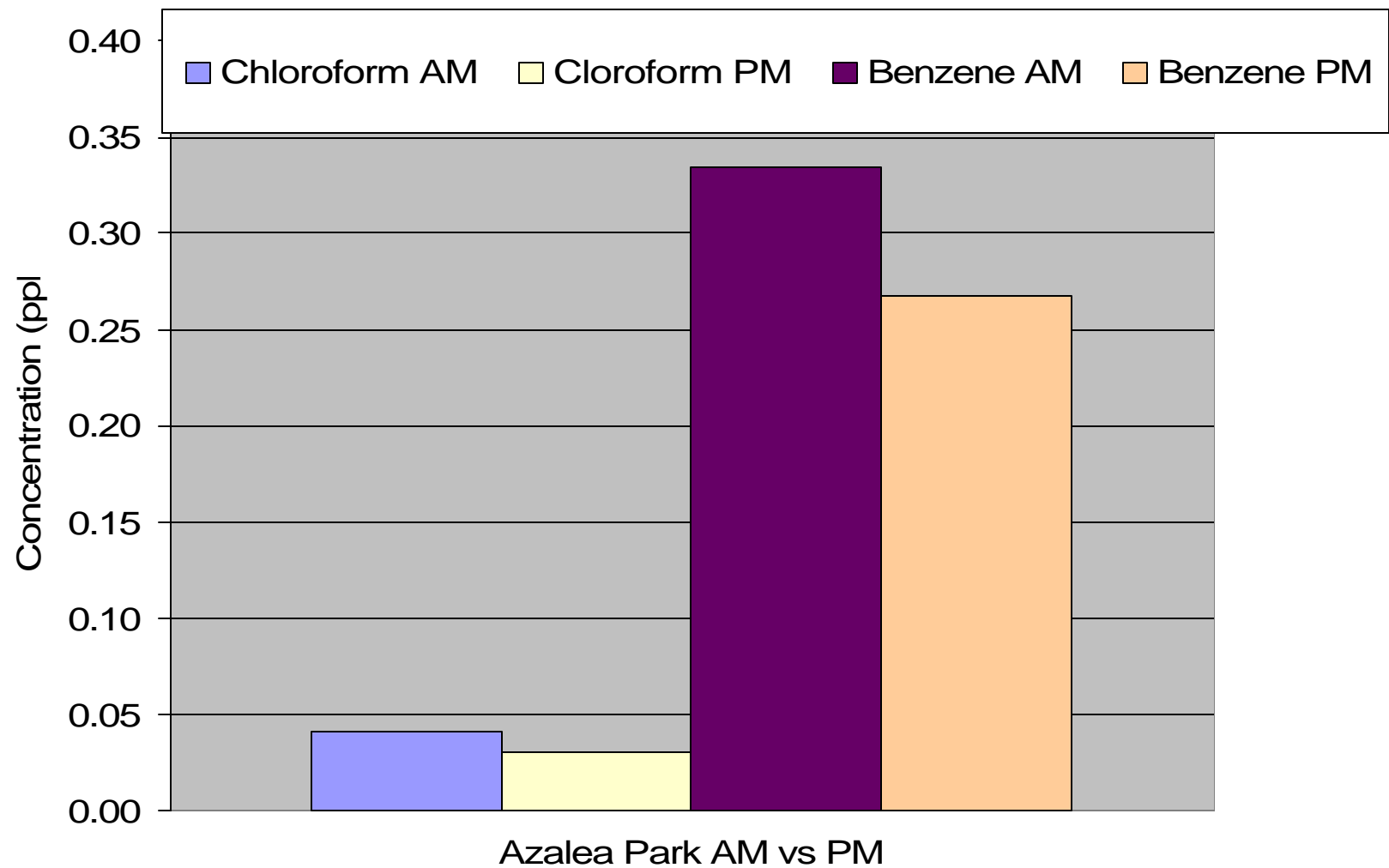
# Benzene Oct - Dec 2001 Averages ( $\mu\text{g}/\text{m}^3$ )



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# Diurnal Comparison- Azalea

(Jan-Dec 31, 2001)



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# Carbonyls

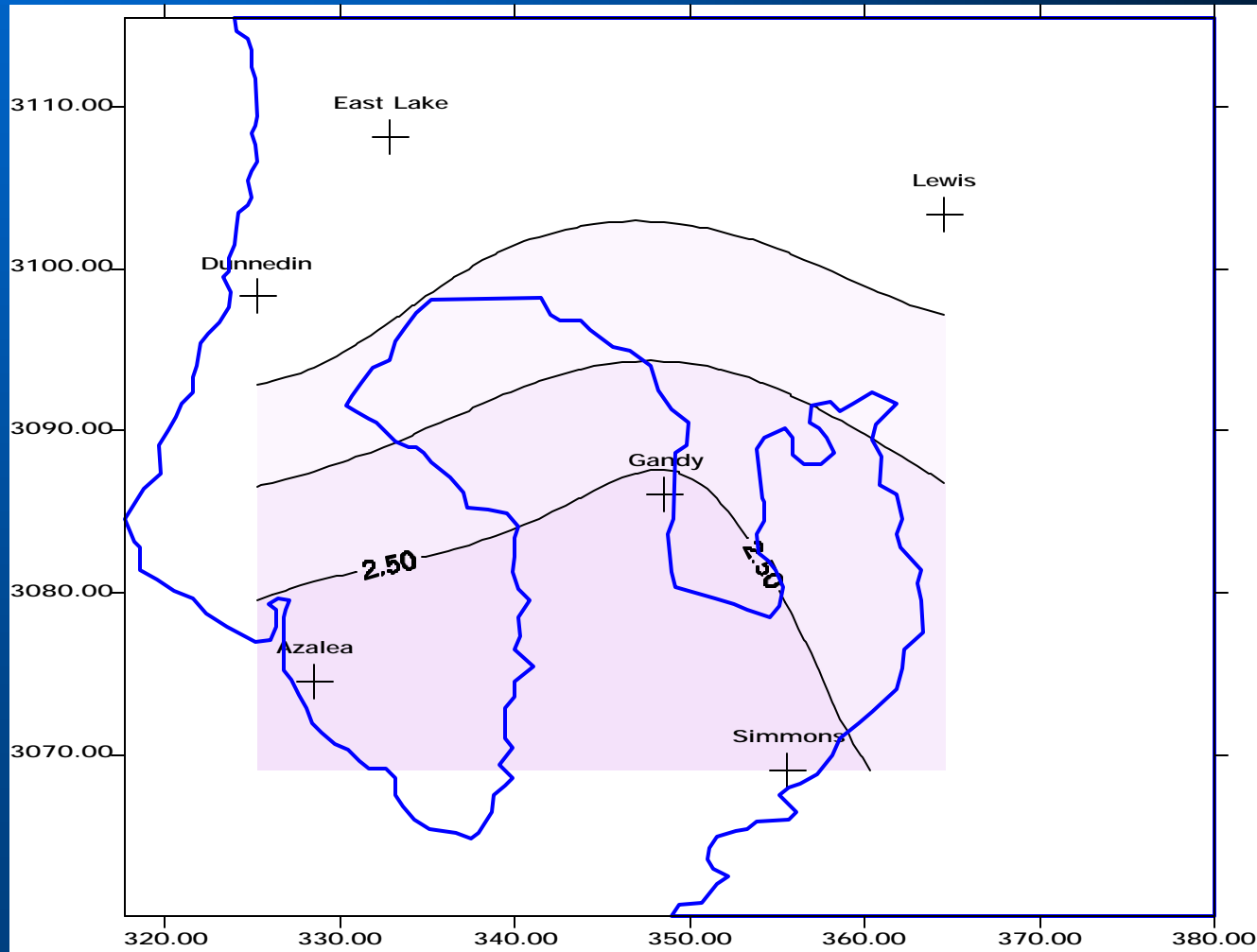
- 12 monitored, 3 of which are HAP's, 2 are UATS
- 9 of 12 detected > 95% of time
- 1 detected > 85% of time
- 2 detected only 50% of time:  
Isovaleraldehyde,  
2,5-dimethylbenzaldehyde

# Carbonyls (Jan – Dec 2001)

	Detected	Ann Average	Cancer BM
Formaldehyde	340	3.745 ug/m3	0.077ug/m3
Acetaldehyde	344	1.792	0.455
Acetone	341	1.888	None
Hexaldehyde	344	0.411	None
Butyr/Isobutyraldehyde	340	0.319	None
Benzaldehyde	340	0.252	None
Propionaldehyde	336	0.204	None
Tolualdehyde	344	0.193	None
Valeraldehyde	333	0.096	None
Crotonaldehyde	294	0.071	None
Isovaleraldehyde	186	0.000	None
2,5-dimethylbenzaldehyde	183	0.014	None

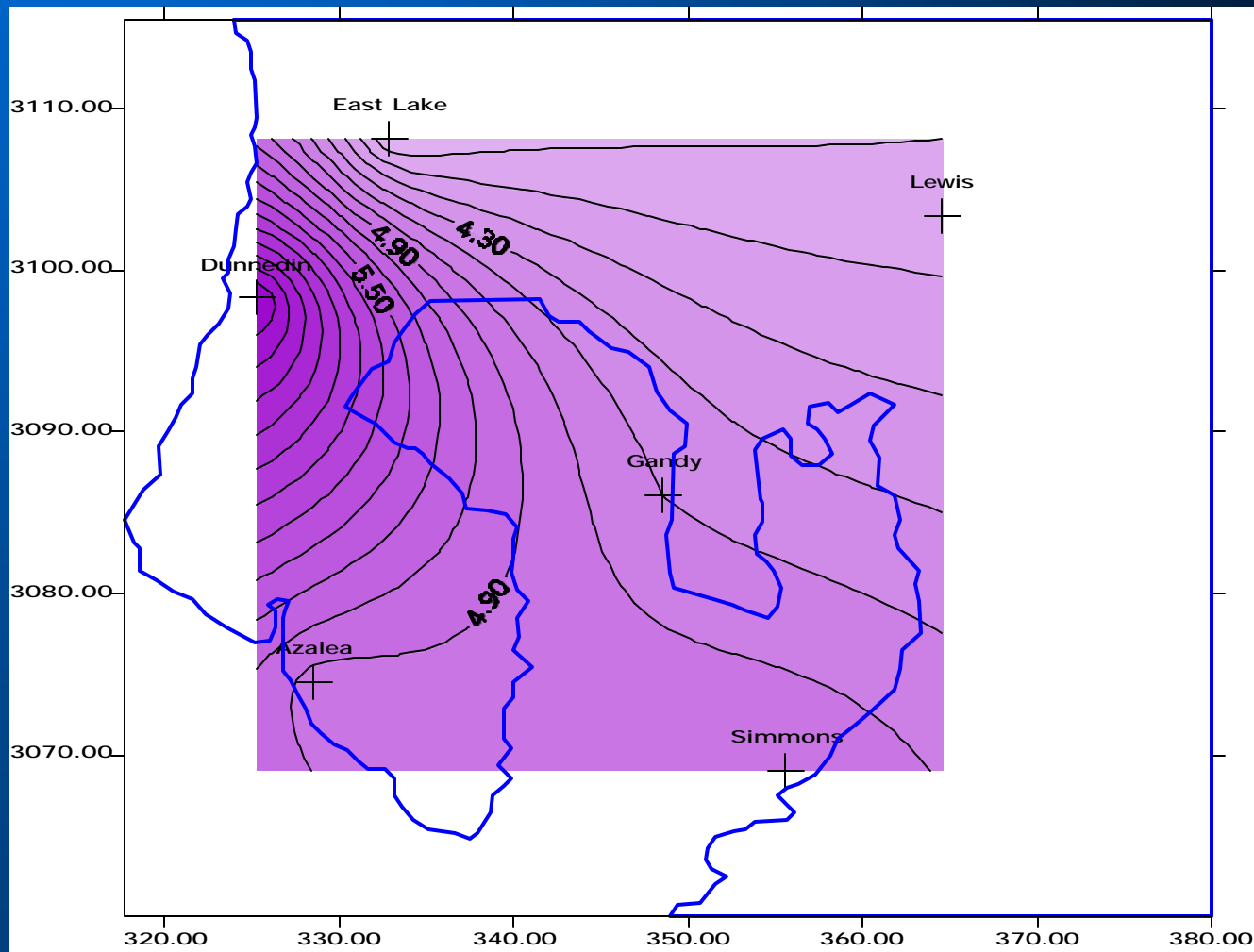


# Formaldehyde Jan-Mar 2001 Avg (ug/m3)



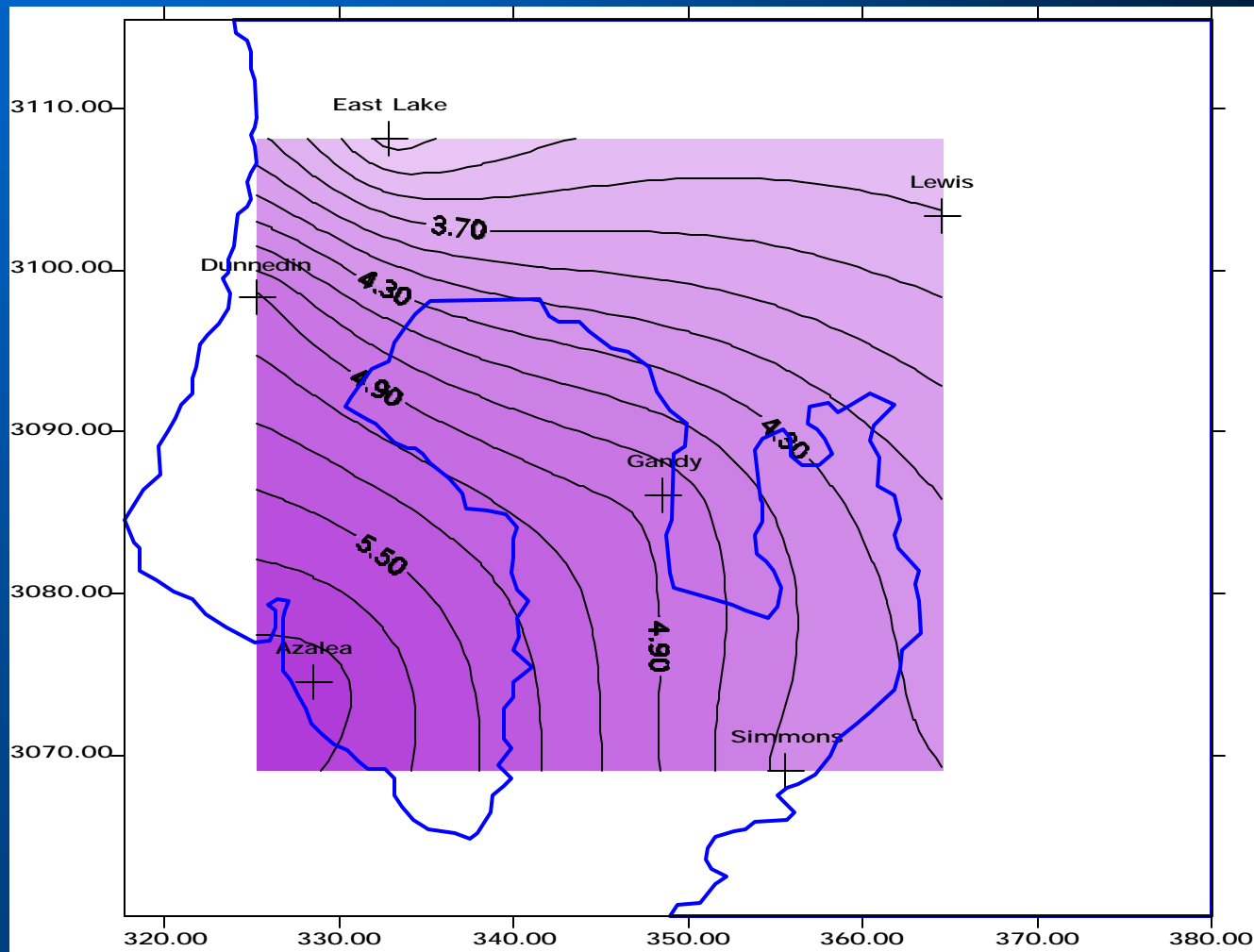
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# Formaldehyde Apr – Jun 2001 Averages ( $\mu\text{g}/\text{m}^3$ )



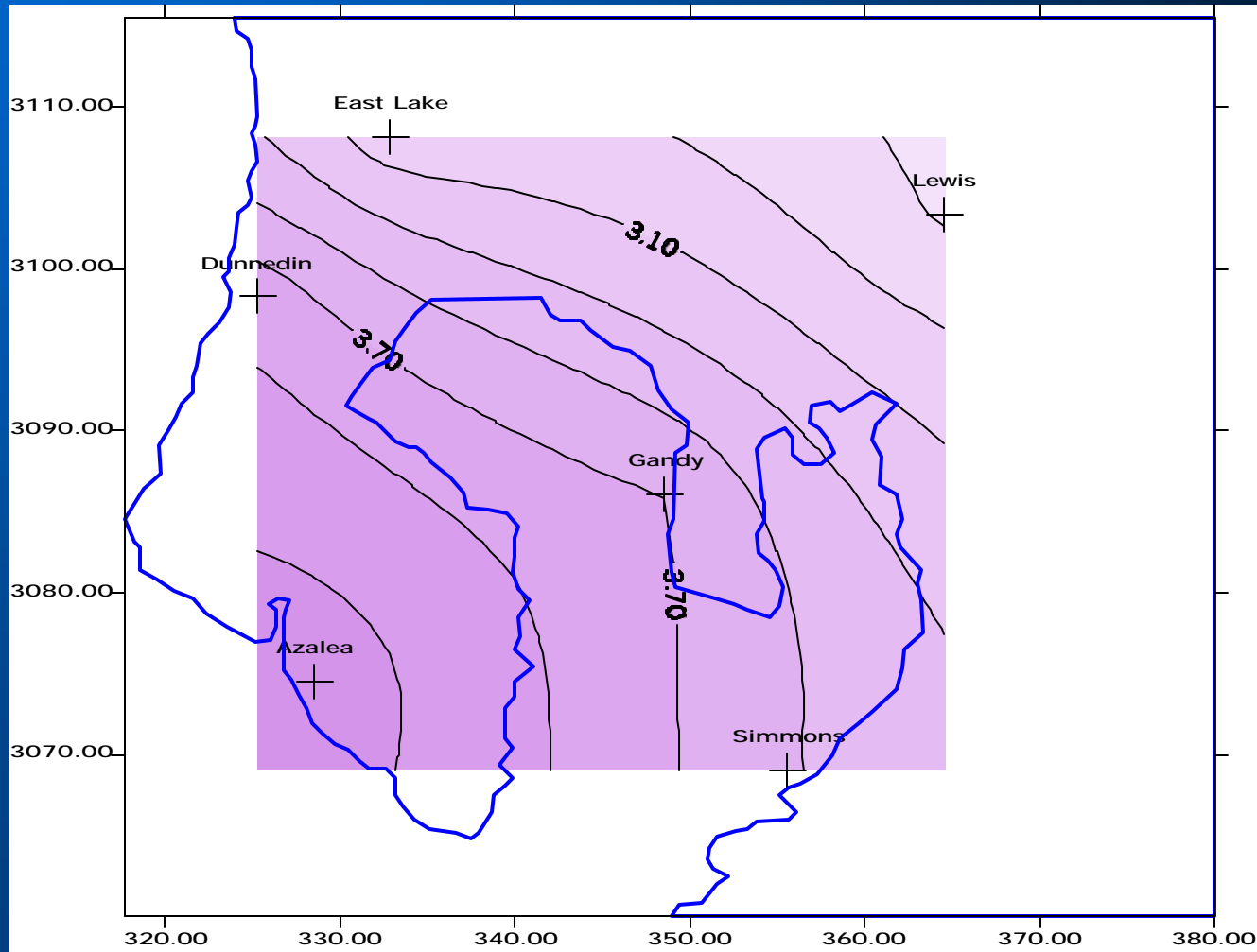
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# Formaldehyde Jul - Sep 2001 Averages ( $\mu\text{g}/\text{m}^3$ )



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# Formaldehyde Oct - Dec 2001 Averages ( $\mu\text{g}/\text{m}^3$ )



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2002

# Metals

- 10 metals collected, 10 of which are HAP's, 7 are UATS
- 6 of 10 exceeded MDL more than 50% of time
- 3 of 10 exceeded MDL less than 10% of time
  - Must be careful how you average this data

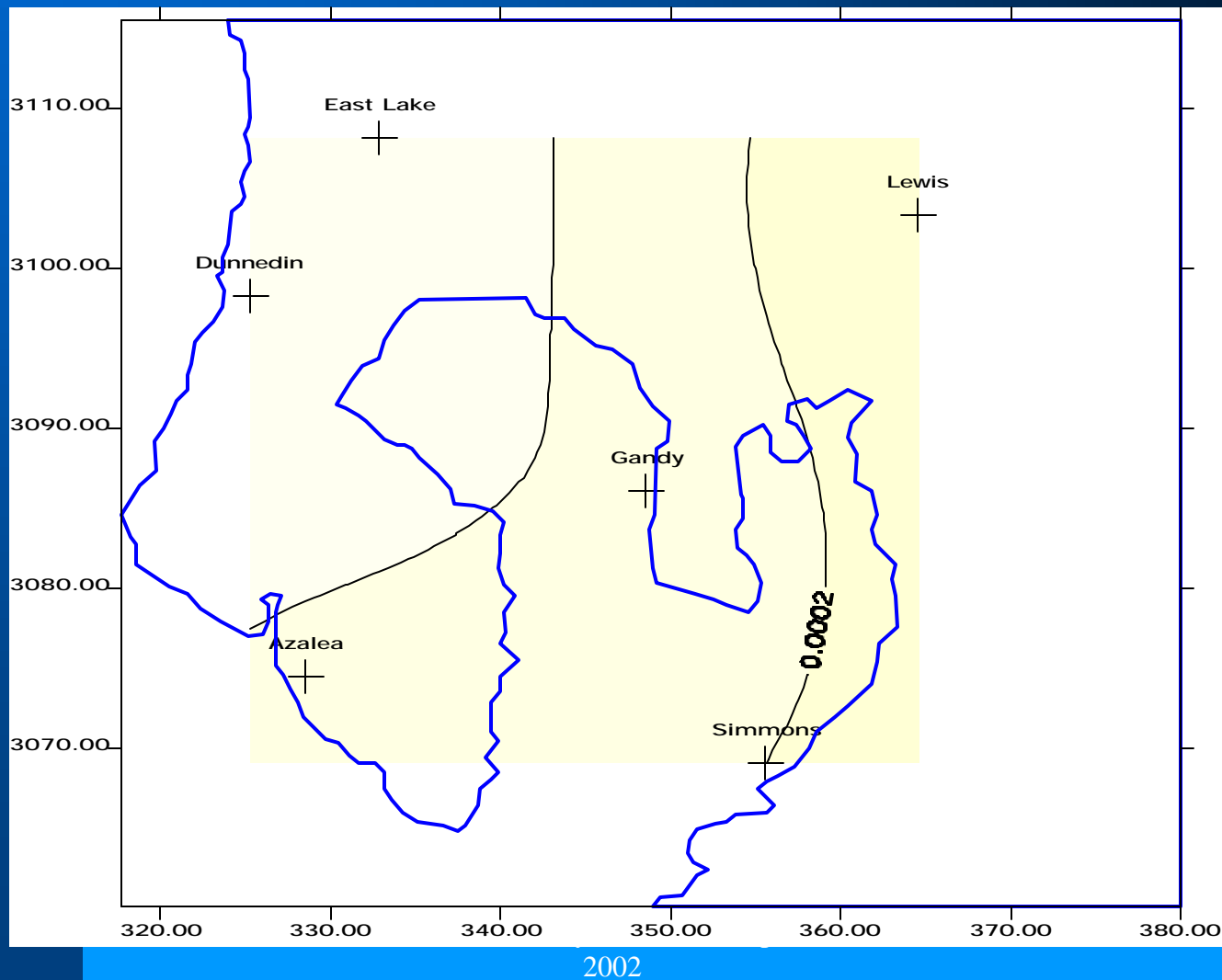
# Metals (Jan – Dec 2001)

	Observations	> MDL	Annual Mean
<b>Manganese</b>	<b>414</b>	<b>413</b>	<b>4.25 ng/m3</b>
<b>Chromium</b>	<b>414</b>	<b>412</b>	<b>1.42</b>
<b>Lead</b>	<b>414</b>	<b>404</b>	<b>3.81</b>
<b>Nickel</b>	<b>414</b>	<b>373</b>	<b>3.16</b>
<b>Beryllium</b>	<b>414</b>	<b>329</b>	<b>0.34</b>
<b>Cobalt</b>	<b>414</b>	<b>260</b>	<b>0.21</b>
<b>Cadmium</b>	<b>414</b>	<b>182</b>	<b>0.29</b>
<b>Selenium</b>	<b>414</b>	<b>36</b>	<b>0.60 / 0.16*</b>
<b>Arsenic</b>	<b>414</b>	<b>35</b>	<b>1.85 / 6.21*</b>
<b>Antimony</b>	<b>414</b>	<b>13</b>	<b>5.42 / 11.97*</b>

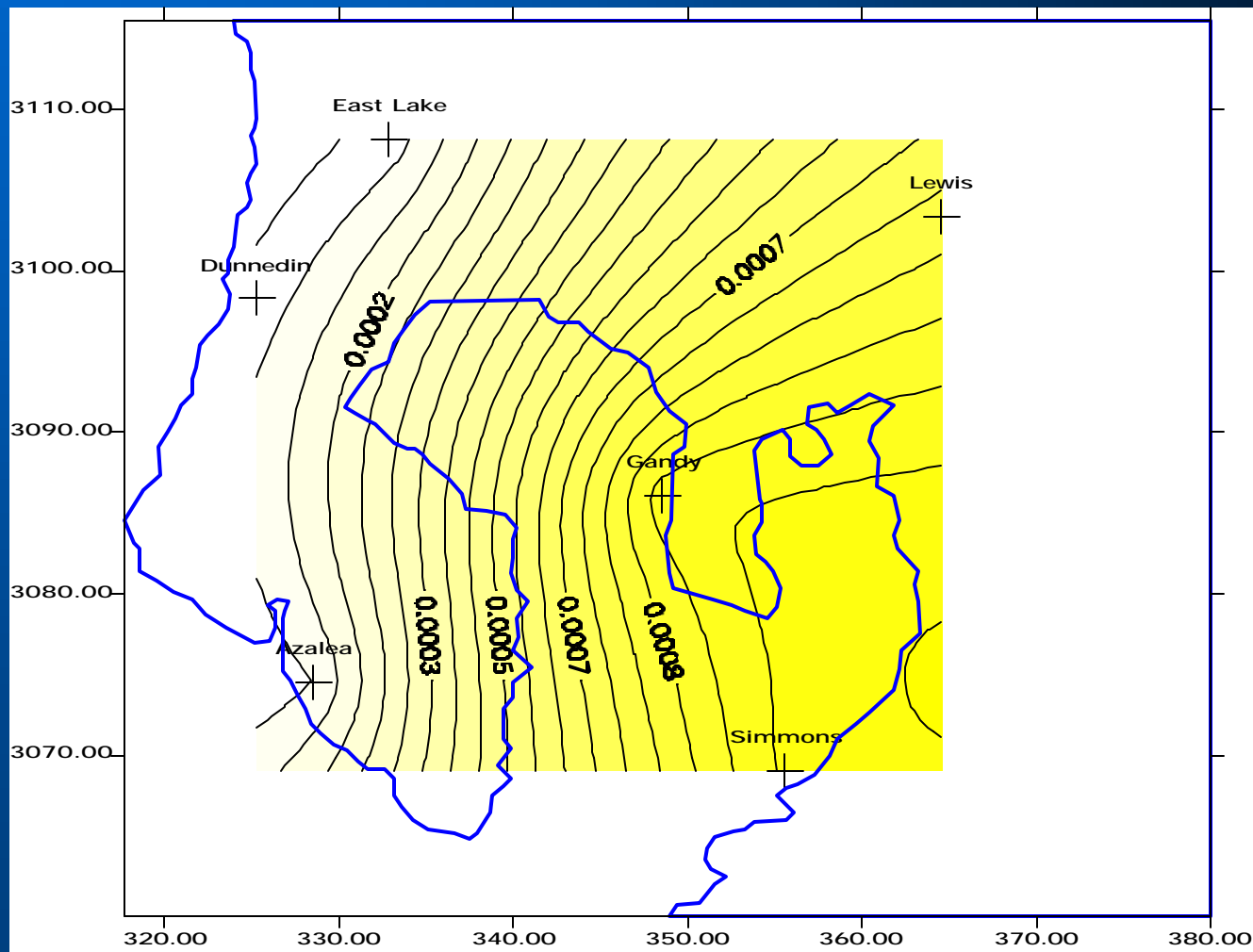
\*average of samples which exceeded MDL

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# Chromium Jan-Mar 2001 Avg (ug/m3)



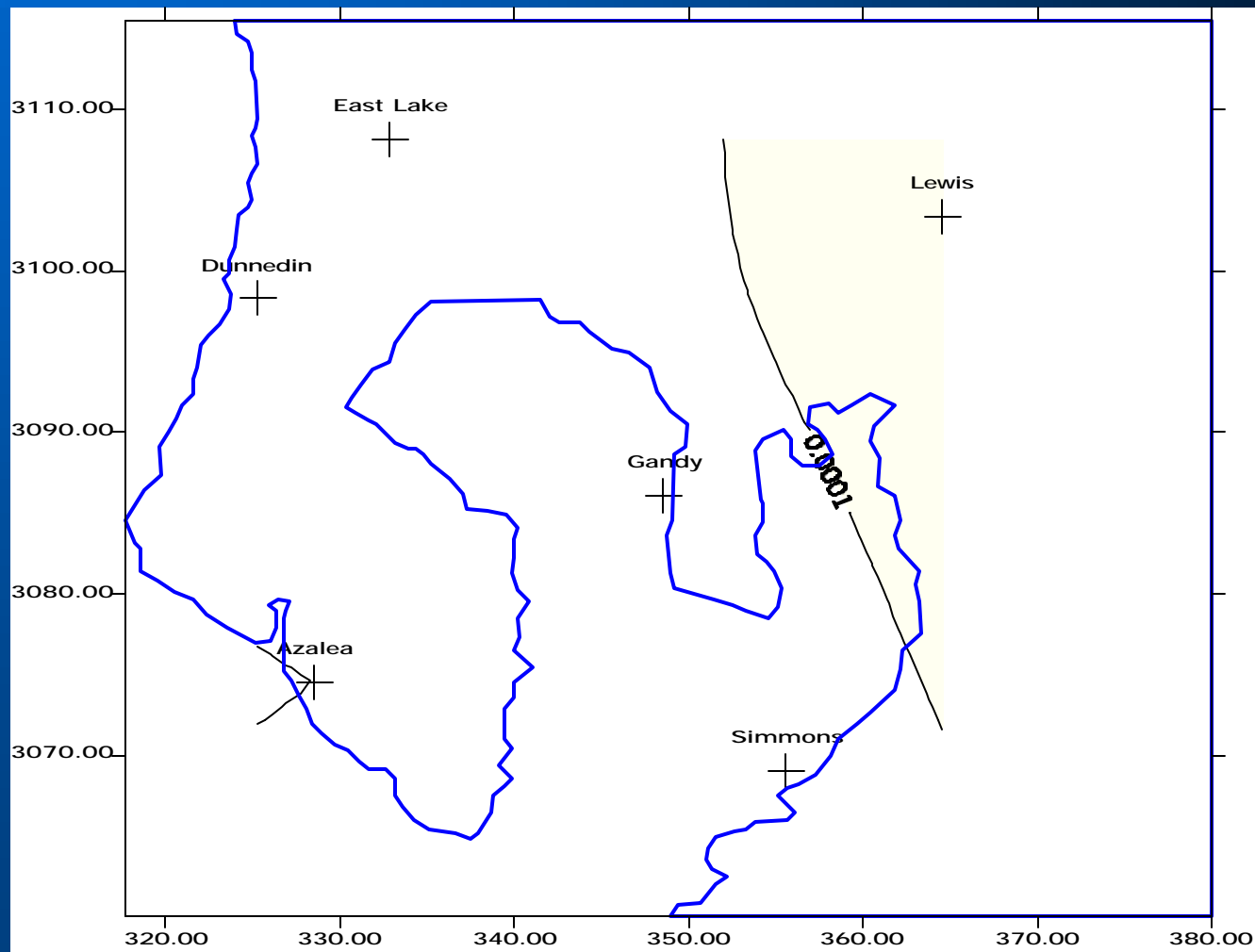
# Chromium Apr - Jun 2001 Avg (ug/m<sup>3</sup>)



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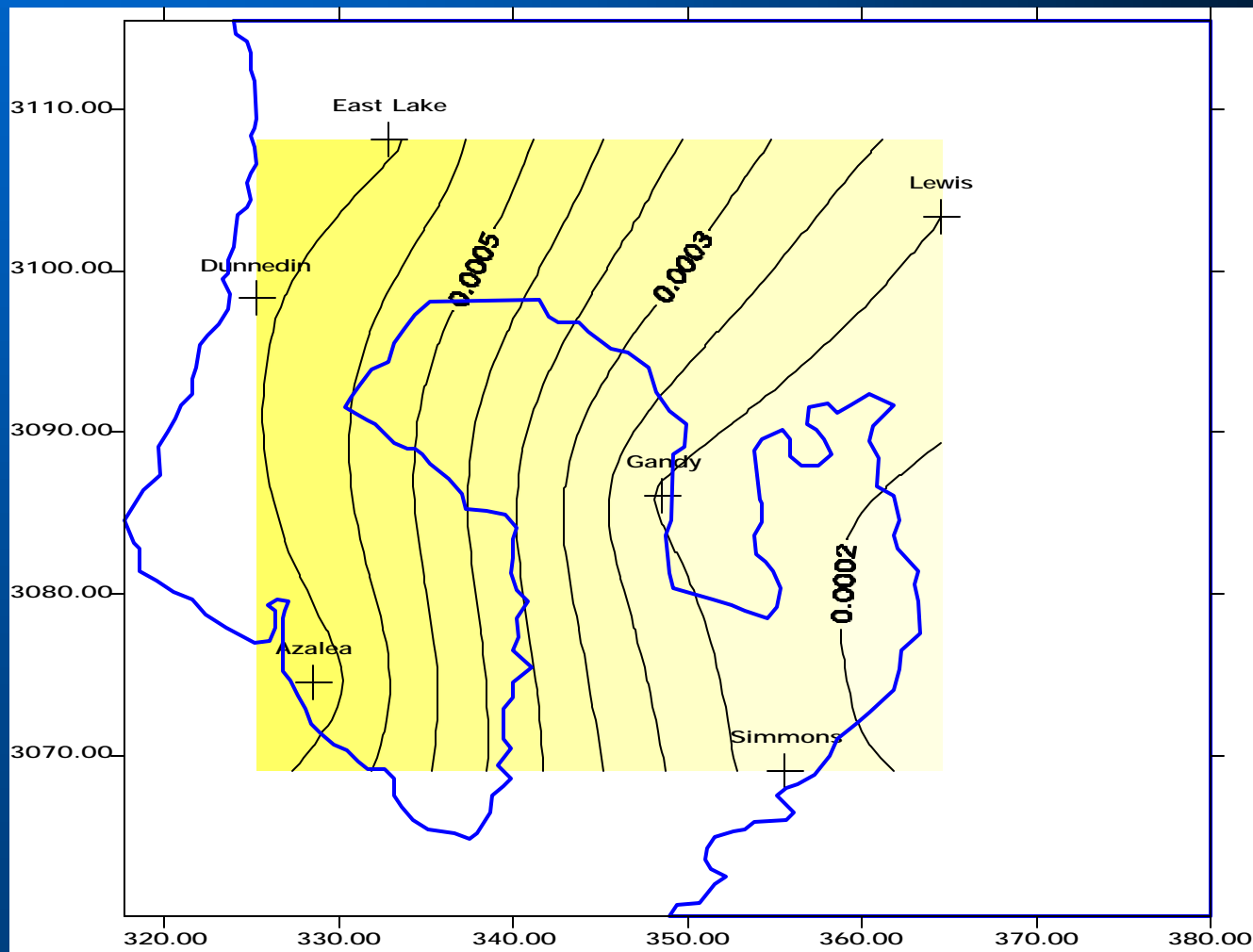


# Chromium Jul - Sep 2001 Avg (ug/m3)



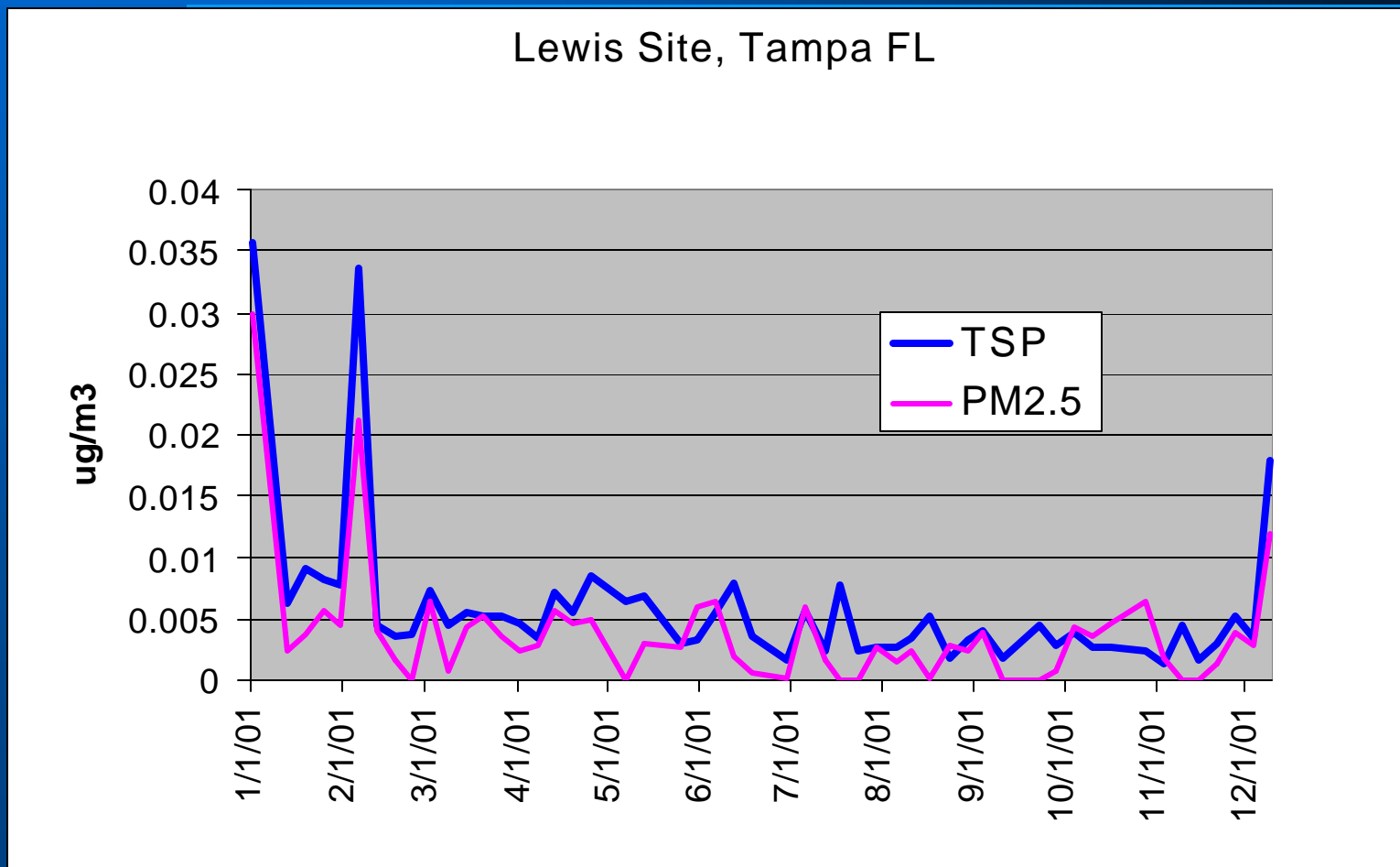
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# Chromium Oct - Dec 2001 Avg (ug/m<sup>3</sup>)



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# Lead – TSP vs PM<sub>2.5</sub> Speciation



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# POM, PAH's, PCB's

- Monitored at Gandy Mar-Oct, 2001
- High-Vol Sampler w/ 10-cm quartz filter and polyurethane foam (PUF)
- 6 day cycle, 24 hours/day, FDEP lab
- Measured PCB 8, 18, 28, 44, 52, 66, 101, 105, 118, 128, 138, 153, 170, 180, 187, 195, and 206
  - No PCB's were detected on any samples

# POM & 7-PAH's (Jan-Dec 2001)

	Detected	Average
Acenaphthene	1	0.00019 ug/m3
Acenaphthylene	0	ND
Anthracene	22	0.00032
Benz(a)anthracene	1	ND
Benzo(a)pyrene	8	0.00011
Benzo(b)fluoranthene	14	0.00023
Benzo(k)fluoranthene	0	ND
Benzo(g,h,i)perylene	9	0.00008
Chrysene	14	0.00014
Dibenz(a,h)anthracene	0	ND
Fluoranthene	32	0.00309
Fluorene	32	0.00086
Indeno(1,2,3-cd)pyrene	0	ND
Napthalene	18	0.00064
Phenanthrene	34	0.00678
Pyrene	32	0.00169
	Average	0.00128 ug/m3
	Ca BM	0.00048

# NATA vs Monitoring

- Of 33 NATA compounds, 22 were monitored in 2001
- NATA modeling indicated 12 exceeded health benchmarks
  - Of the 12:
    - 10 were monitored in the Tampa Bay area
    - 2 were not monitored
- Of 22 monitored for:
  - 16 exceeded health benchmarks
    - 6 which exceeded on monitors were not predicted to exceed by NATA modeling
  - 6 did not exceed health benchmarks
    - 2 predicted by NATA to exceed, did not exceed

# Summary

- **HAP Inventories provided the data for:**
  - **NTI**
  - **NATA**
  - **Monitoring**
- **Improved Facility Inventory reporting**
- **Closer attention to Area Source inventories**

# Future

- **Continue annual Point Source HAP inventories**
- **Continue All Sources HAP Inventory every 3 years**
- **Use Inventories to quantify HAP emissions reductions**
- **Continue Toxics Monitoring as funds permit**